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WEST EUROPE REPORT

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CONTENTS

ELECTRONICS

CIT-ALCATEL ENTERS CUSTOMIZED CIRCUIT MARKET

Paris ELECTRONIQUE INDUSTRIELLE in French 1 Feb 82 pp 19-20

[Article: "Alcatel Semiconductors Comes on the Scene"]

[Text] CIT-Alcatel recently gained a foothold on the market for customized circuits by creating, several months ago, Semiconductors Alcatel (SCA) following an agreement made 20 January 1981 by which it acquired 25 percent of the capital of the American company SPI (Semi Processes, Inc).

SCA, whose main interest is customized printed circuits, programmed or preburned, has left little room in its plans for standard printed circuits: The resale of SPI's standard DMOS [double-diffused mercury-oxide semiconductor] circuits will account for only Fr 3 million of the Fr 28 million of turnover planned for 1983, and Fr 17 million of the FR 87 million planned for 1985. SCA will study and design circuits in all technologies, but will distribute only CMOS [complementary mercury-oxide semiconductor] and will subcontract other technologies at this level.

Indeed, the interest of the CIT-Alcatel-SPI agreement seems to be primarily technological in nature, since SCA is in fact using CMOS technology with 5-micron selective oxidation on preburned SPI matrices with 300, 544 and 1,000 gates, programmable by a single metallization mask. The resulting characteristics of this technology are (typical) internal propagation times of 3 to 5 nanoseconds, input of 3 to 12 volts, and a fan out of 2. This year SPI should bring out matrices with 3-micron patterns and with two levels of interconnections, but should not be followed by SCA in this field before 1984. This is for financial (and also technological) reasons. Since the designing has already started in Villarceaux, near Paris, the rest (masks, diffusion, printing) could begin this year at the neighboring Marcoussis center, originally earmarked for ECL [emitter controlled logic] circuits and high fidelity transistors; the manufacture of wafers, handled up to present by SPI in the United States, will be performed in France, in late 1983, in a new plant in Aix-les-Bains, the capacity of which should ultimately reach 1,000 groups of 4 chips per week. In terms of design, the Villarceaux center is now capable of accepting 100 preburned circuit projects a year (half for the group's needs).

The preburned circuit prototypes will be delivered to the user between 6 and 14 weeks after the plan is submitted and production could begin within 8 weeks

after the delivery of the prototype. Finally, in order better to understand this infatuation of CIT-Alcatel (and so many others), with customized circuits, we note the company's estimates concerning the customized MOS [mercury-oxide semiconductor] circuit market, as follows: In 1983 the market in Europe would be Fr 2.5 billion and should increase to Fr 3.2 billion in 1985. In France the market for preburned circuits alone would go from Fr 113 million to Fr 254 million for the same years, respectively.

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CSO: 3102/196

EEC TO FUND R&D IN INTEGRATED CIRCUIT MANUFACTURING MACHINES

Paris INDUSTRIES & TECHNIQUES in French 10 Feb 82 p 14

[Article by Jean-Francois Desclaux: "Integrated Circuits: A European 'Machine Plan'"]

[Text] Breaking the Virtual U.S. Monopoly by 1985

True independence with respect to integrated circuits presupposes two things: mastering the basic technologies and design capabilities, but also having one's own manufacturing machines. The United States is the only, or almost the only, country in this position. The European Community wants to break up this virtual monopoly. It is rallying its forces to give itself equipment capable of satisfying the objectives of the next 5 to 10 years: attaining submicronic technologies. Adopted by the EEC Council of Ministers, a "regulation" which provides for the construction of a batch photorepeater between now and mid-1984 has just entered into force. The machine should handle batches of 6 chips, with an exposure field of 1 cm and with a line-etching precision of 1.25 microns. The output should be about 50 batches of 4 chips per hour.

Electronic maskers should inscribe 1-micron lines on 15 to 20 batches of 6 chips an hour. The precision of alignment will reach 0.1 micron for minimum characters of 0.5 micron.

Plasma-etching equipment is defined in terms of the materials etched: doped silica, silicon nitride, polycrystalline silicon, silicides, aluminum, metals used for interconnection and resins. The performances will be on the same order as those of other links in the manufacturing chain: 1.5 micron lines and outputs of 50 batches per hour. The community will provide 50 percent financing for projects for researching and developing manufacturing machines. These machines also include test machines and CAO [circuit activation order] machines for designing integrated circuits in the new technologies. Thus this equipment should be built by the expiration of this plan, set for 31 December 1985. It has been noted, however, that certain research centers plan to cross the micronic threshold about 1983 and accordingly they need these machines here and now.

Two Hundred and Fifty Million Francs

Funds equivalent to approximately Fr 250 million will be granted to European countries capable of complying with the specifications set more or less

provisionally by this regulation. In fact, since they date from 1980, these specifications require some updating and are still likely to be changed following the development of the first contracts planned for the end of 1982. The invitations for bids will be published shortly in the official journal of the European Community and will be addressed to established industries in the community.

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CSO: 3102/196

RESEARCH INDUSTRY TO SUBSIDIZE MICROELECTRONICS

Hamburg DER SPIEGEL in German 5 Apr 82 pp 61, 63

[Text] With lots of money, Andreas von Buelow will help German industry convert to microelectronics.

In introducing futuristic technologies, Federal Research Minister Andreas von Buelow fears that German companies are not the quickest: "In the entire field of microelectronics we are bringing up the rear."

Yet, at the beginning of this year the sluggish company chiefs suddenly exhibited unusual speed. There was money to be had: Inside of 6 weeks, companies from all over Germany submitted over 400 development projects from the field of microelectronics to the research ministry.

The reason for the speed is illuminating. From 1982 through 1984 the research minister will distribute DM 300 million for the development of products in which, according to the broad definition, microelectronics is the functional determinant in a technical sense. Over half of the funds planned for this year have already been distributed.

It has been a long time since the research minister has been as generous as in this "special program:" The yearly budget is five times higher than for the earlier program "Applications of Electronics." And, contrary to the usual rule, these grants do not have to be paid back. Also, getting the money has never been easier.

On the two-page application form, not much more than address and bank account number need be given. Per the ministry's information brochure, applicants are limited to a five-page description of the project containing only the "most essential information."

Whoever fills out the forms according to instructions will have the support money in his pocket almost instantly. Whether or not the planned development is technically and economically reasonable will not now--as was done in the past--be critically checked.

The lax procedure which will bring millions to the firms could be more effective than the highly regimented methods used in the past.

Sometimes more time elapsed waiting for authorization than was required for the actual development work. Not seldom, the companies--called "aid recipients" in ministerial jargon--had to wait a year or more.

In the complex subsidy maze, large firms which could retain experts in governmental subsidy procedures came out better than small and medium-sized companies. The giants of the German electrical industry--Siemens, AEG and Philips-Valvo--divided the lion's share of the electronics support grants almost exclusively among themselves.

These firms also established the trend in technology: About half of the money which the ministry put into microelectronics (last year almost DM 120 million) has until now been reserved for building up an independent German chip production capability. Only the large companies dared attempt the expensive and complicated production of these tiny electronic circuits which can integrate the computing power of a main-frame computer on a silicon chip.

The Bonn patrons hoped that with this subsidy German industry could narrow the U.S. lead. The U.S. Company Intel marketed the first high-performance chips in 1971, and ministry staffers feared that the German users of these chips would be treated as customers of second choice by the Americans.

"Whom would you likely supply first when chips are scarce?" asks, for example, Uwe Thomas, the person responsible for electronics support in the research ministry. To him the answer is clear: "Naturally, customers in the United States since that is the largest market."

Still, 8 years of support has not made the FRG independent of foreign chip production. The result of millions in subsidies is very modest: "one or two production lines performing at world standards," according to Thomas.

Thus, Siemens can produce electronic components with the largest storage capacity achieved anywhere to date; these are designated 64-K-chips. However, in the market, the Germans are far behind in the technologically most advanced components, the MOS memory circuits. Their market share in this technology dominated by the Japanese and Americans is about 3 percent worldwide.

For the practical application of microelectronic products--for machine-tool controls or as electronic controls in auto engines, for example--the support officials have had little left over: "With such funds we would have primarily helped only the foreign chip manufacturers," said Thomas in justifying withholding such funds. Now however, the Germans must speed up the application of microelectronics if they do not want to risk falling behind in important export markets. Only 15 percent of the potential applications of microelectronics in the FRG has been realized to date according to estimates by market researchers.

For example, the Japanese realized sooner than most German companies that programable electronic controls would make it possible to use a particular machine for many different purposes. Such installations are more economical

for customers than German machines which are specialized for particular functions.

Research Minister von Buelow now cautiously concedes that the official support policy has sorely neglected the small and medium-sized companies which are just at this time making a showing in the machine building and auto accessory industries: "With us, new technologies have possibly for too long been coupled with large-scale research and large companies."

The DM 300 million program, which was adopted last fall in the midst of general budget cutting, is now supposed to salvage what can still be salvaged. "With this bow wave, we are attempting to mobilize everything possible at the product level," explained hopefully Klaus P. Friebe, chief of the VDI Technology Center in Berlin.

At the initiative of the research ministry and financed with Federal money, this special division of the Engineering Society will help small and medium-sized companies with the introduction of microelectronics and oversee the distribution of support funds.

So that the money does not again wind up just in the hands of the large companies, the subsidy is limited to a maximum of DM 800,000 per company.

This is certainly no guarantee of success. "Naturally, there will always be people who only want the money," concedes Friebe. And certainly Bonn will continue to put money into companies which propose almost any type of microelectronics development program.

The smart companies who somehow got into the microelectronics business just at the right time are the first to grab for the new special program. However, the companies which just have to have these funds cannot be helped by money alone.

Often small companies lack the ability to organize for the introduction of new technologies, and many of these companies have sunk to the know-how level of vendors only.

For this reason, the special program finances for the first time the use of outside consulting firms. The technology center with its 55 employees, most of whom bring with them experience from related industries, will transfer the art of technology management to these companies. The task requires a certain sensitivity for, as Friebe of the Berlin Technology Center knows, "One must frequently tell them disturbing truths."

They do not always want to hear the message. For example, at the beginning of the year a North German chamber of industry and commerce refused to let the employees of the technology center use their auditorium when the experts from Berlin wanted to explain the workings of the Bonn support program. The chamber of commerce gentlemen let it be known that this support program does not fit into the free-market economy.

9160
CSO: 3102/228

SIEMENS CHIP TECHNOLOGY EXPANDING

Frankfurt/Main FRANKFURTER ZEITUNG BLICK/DURCH DIE WIRTSCHAFT in German 6 Apr 82 p 5

[Text] In the opinion of Siemens, the trend to constantly higher packing densities and better processing performance in the technology of the central units of computer systems is continuing uninterrupted. Beginning in 1982, at intervals of 2 to 3 years, there were four generations of semiconductor memories alone. The capacity of the storage modules increased each time by the factor of four. In its computers Siemens currently uses 64-K-bit modules, developed and manfactured in house. Siemens says the next generation, 256-K-bit storage chips, are now being developed by the company.

Besides software programmed microprocessors, logic components (gate arrays) are being used in the Siemens central units, whose individual specific functions are determined in the manner of hardware in the last step of production. The gate-array chip with 36 logic cells, developed and produced by the company using the so-called master-slice process, provides very high processing performance in the central units of the 7500 series. A master-slice gate array with 120 logic cells is already under development. Its gating circuit lag times will be under 0.5 nanoseconds.

According to Siemens, rapid interplay between memory registers and processing circuits is of great importance in the central unit. Accordingly, Siemens has for the first time implanted a storage field (RAM) [Random Access Memory] between the logic cells on one of its newest master-slice chips. With an access time of only 3.5 nanoseconds, it is among the fastest semiconductor memories in the world at this time.

As part of the development of large circuits into increasingly refined structures, the required electrical charges are becoming smaller and smaller. This increases the risk of "soft errors," wrong circuits which occur only occasionally and are not reproducible. They are caused in part by minimal electrical disturbances, in part created by alpha particles in the vicinity of the chips, but also by particles from omnipresent cosmic radiation. These effects would lead to several errors per day in the working memory.

Siemens plans to counter this problem in two ways: The 64-K-bit MOS [Metal Oxide Semiconductor] chips are coated with a photolithographically structurable protective layer of polyimid, developed in Siemens research laboratory, which absorbs alpha radiation. The principal measure is that the central units work with a "correction refresh" in the working memory. At regular intervals, and without the

central processor being affected, the contents of the working memory are read automatically, fed through the error correction unit and rewritten in correct form.

In the new 7.561 and 7.571 models, the pipeline principle has been expanded to five stages. Up to five commands can be run simultaneously, which, according to Siemens, corresponds to a four-fold increase in performance compared with an otherwise equally fast computer, but which is working serially.

9581
CSO: 3102/234

BRIEFS

SPECIAL MICROELECTRONICS PROGRAM--Federal Research Minister Andreas von Buelow expressed his satisfaction concerning German industry's great interest in taking advantage of the opportunities offered by the new special program "Application of Microelectronics:" The great number of proposals shows that German companies are not wanting for ideas." The companies understand that their long-term competitive capability in high-technology products is being established. This special program will aid companies which want to develop products in which microelectronics is the functional determinant. The VDI Technology Center (Budapest Street 40, 1000 Berlin 30) has been commissioned to oversee the program which was presented to the public in December 1981. Since that time, over 1,000 applications have been received by the VDI Technology Center. In January 1982, the first month of the 3-year special program, 325 development proposals with a contract value of DM 75 million were funded. The research minister was especially pleased that most of the proposals came from small and medium-sized companies. The large number of good ideas and project proposals shows the correctness of the concept which features a simplified contracting procedure to help companies develop new products based on microelectronics with the ultimate goal of opening up future markets. [Text] [Duesseldorf VDI NACHRICHTEN in German 26 Feb 82 p 2] 9160

CSO: 3102/228

SWEDISH RESEARCHERS WORK ON ELECTRICALLY CONDUCTIVE PLASTICS

Stockholm DAGENS NYHETER in Swedish 8 May 82 p 36

[Article by Lars-Ingmar Karlsson]

[Text] Plastic and electricity are hardly terms that are readily connected with each other. But now a way has been discovered to "contaminate" certain plastics in such a way that they may become excellent conductors of electricity.

A group of researchers is working with these plastics at the Stockholm Institute of Technology. Automobile batteries of plastic may be possible in the future.

For plastic to conduct electricity it must act like copper and similar metals. The negatively charged electrons in atoms of these metals are extremely mobile. They travel readily from atom to atom when a voltage is applied.

Plastics, on the other hand, are completely different from metals. First of all, they consist of several elements: carbon and hydrogen are always included, usually with oxygen, nitrogen, and other elements. Secondly, their electrons normally are bound to certain atoms so that, for example, a carbon and a hydrogen atom have two electrons in common.

Sometimes, however, two carbon atoms share four or six electrons. These carbon atoms are said to have double or triple bonds. These bonds can move from one carbon atom to another. The electrons move and it is this principle that is used when plastics are converted into conductors.

Holes Move

Having double bonds is insufficient to make a plastic conduct electricity, however. A "disturbance" is also needed for a current to flow. These disturbances may be introduced by "contaminating" the plastic with a substance that attracts electrons. In this way, there will be an electron deficiency in some bonds of the plastic. Positive "holes" are formed.

These holes move readily in the plastic when an electric voltage is applied. Of course, the movement of the holes is actually a movement of electrons

between carbon atoms. A stream of electrons flows in the plastic in the same way it would in a copper wire.

An impurity may also be used that readily releases electrons, but the result is the same when a voltage is applied.

"Conducting plastics are being developed extremely rapidly," said Goran Ahlgren, assistant professor at the Stockholm Institute of Technology.

He recently began working with the first Swedish research group in this area.

"So far, we at the institute simply have repeated what others already have done, but eventually we hope to discover new properties in these materials and develop them.

Evaporated

His laboratory now has equipment for producing polyacetylene film. The starting material in this process is acetylene, which is a hydrocarbon containing a triple bond. The acetylene can be evaporated and allowed to form a thin film, for example in a glass flask. The acetylene molecules join together and form so-called polymers.

"The thin film of polyacetylene can then be 'doped' with, for example, iodine so that it becomes a conductor," Goran Ahlgren explained.

"We want to learn to produce such films so that other researchers and companies will buy it from us. Their research must not be stopped due to a lack of film."

The polyacetylene film is extremely sensitive to air. It becomes brittle and gradually loses its ability to conduct electricity.

"One of our goals is to produce a film that is stable in air," Goran Ahlgren said.

He and his fellow researchers also are examining other conductive plastics. They have used one substance called polyparaphenyl to make a small battery in which they are measuring the current and the voltage.

Changes Color

Another substance called polypyrrole is interesting because it changes color when a current is passed through it. It changes from black to light green.

It operates in the same manner as liquid crystals in calculators.

"There probably are better substances than polypyrrole, but when the principle of its operation is known, then other materials may be 'tailor-made.' This technique could be used in large signs in which liquid crystals would be too expensive."

Conductive plastics of various materials could conceivably be used in solar cells. They could also be used to shield sensitive electronic equipment because they can absorb strong electromagnetic waves, for example from nuclear explosions.

Carpets of conductive plastics could be used to remove unwanted static electricity from areas around computers.

Automobile Batteries

It should also be possible to produce automobile batteries of plastic in the future.

"One advantage of plastic batteries is that they are much lighter than ordinary batteries. They may take up more space, however, but they may be given almost any shape and they may be put into doors, for example," Goran Ahlgren said.

He emphasized that it would take time before products of conductive plastic would be common on the market--perhaps 5 to 10 years--but there is great interest among some companies. In Sweden, both the battery manufacturer SAB Nife and LM Ericsson are following the research closely. In America IBM and Rank Xerox are involved in this field.

9336
CSO: 3102/260

AUTO INDUSTRY PREPARES TO EMPLOY HIGH PERFORMANCE COMPOSITES

Paris INDUSTRIES & TECHNIQUES in French 10 Mar 82 p 14

[Article by Alain Perez: "HP Composites: Auto Industry Prepares"]

[Text] The honeymoon between HP [high-performance] composite materials and the automobile industry has begun. Renault and the SNIAS [National Industrial Aerospace Company] have signed a basic agreement. Peugeot and the SEP [European Propulsion Company] are continuing their cooperation. Peugeot [PSA] has also just regrouped under one head its Quillery and AOP [expansion unknown] plastics divisions. The creation of a specialized research institute is under way. By 1985, the first of the auto industry's HP composite structural pieces will make their appearance. These will be hybrid materials containing 20 percent glass and 20 percent carbon fiber.

At Peugeot, high optimism reins. "It is not the price that is holding us back," its DRAS [Research and Scientific Affairs Management] is saying, "but rather the techniques of putting them into production for the high output levels we require." Initial tests on the carbon and glass suspension arm have been very encouraging. From the standpoint of resistance to fatigue, this solution is superior to arms forged from GS [expansion unknown] cast iron.

At Renault, the attitude is more cautious. "If fiber prices remain as they are now, there is little hope." According to estimates by the American producer Hercules, the present technique for producing carbon fiber by carbonization based on pyrolyzing leaves no room for a lowering of the price below 90 francs/kg, which appears still too expensive to compete with steel. The basic agreement signed with the SNIAS, however, will lead to the identification of joint working interests.

At Renault, heavy-vehicular applications are being considered, in which required production output rates are lower. At PSA, the preference accorded to Renault by ex-DGRST [General Directorate for Scientific and Technical Research] in matters of common interest still rankles. The two builders express skepticism with regard to the fabrication of carbon fiber in France. "The French chemical industry is suddenly awakening. We will buy where the price is cheapest." Most of the solutions being envisioned are based on glass-carbon mixtures. Carbon fiber is being limited to the strictly necessary. The price ratio between the two is 1 to 30.

Mass production techniques are still in the embryonic stage. The calculation and design of parts, on the other hand, are virtually mastered, thanks mostly to the experience gained in the aeronautics and space industry. In the southwest, a little PMI [Small- and Medium-Sized Businesses] has dedicated its efforts to the fabrication of oars made of carbon fiber. His object is to supply France's rowing team with competitive equipment. For the time being, the French crew is rowing in Japanese. In Normandy, one firm is using the filament winding method to fabricate tubes 12 meters in length for the district heating network of the city of Jonzac. These tubes, 50 to 250 mm in diameter, are made of glass-and-araldite composites. The latest spinoff from this HP composites flap has been the creation of a collective research institute. This institute will be part of the ravenous Ministry of Research and Technology. Initially, Bordeaux seemed well suited to accommodate it, owing to its many aeronautics installations in this sector. Today, Lyon is sailing with the wind and tide. The recent naming of Prof Gobin of the INSA [National Institute of Applied Sciences] at Lyon as head of the Materials Section of the Ministry's Scientific and Technical Mission disturbs Bordeaux's backers. In one corner of the arena there is Aquitaine together with SNIAS, SEP, Dassault and ELF [French Gas and Lubricants]. In the other, there is Rhone-Alpes with Brochier, PUK [Pechiney-Ugine-Kuhlmann Company] and RVI [Renault Industrial Vehicles]. Unless everyone gets together and agrees to select Paris...

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CSO: 3102/239

BRIEFS

CATHODE SPUTTERING AT RENAULT--Surface treatment is not a meaningless term at Renault. After having installed a high-capacity dichromate treatment facility (30 tons/day of hardware, the world's largest) and highly automated, the Regie has just ordered a cathode sputtering facility. It will be the first such facility installed by an an automobile maker in Europe. It is to be operational by the end of this year and will replace an electroplating installation that is presently used to chrome plate over ABS [acrylonitrile-butadiene-styrene]. With a capacity of 150 m^2 per 8-hour working shift, this new facility will need a dust-free room. The complete treatment consists of a coating of adhesive priming, the metal, and an abrasion-resistant glaze. This type of treatment will not tolerate the presence of solid particles that mar the appearance. Unlike the electroplating process, this new process rejects any defective piece categorically. Parabolic headlight reflectors, radiator grilles, door pulls and window cranks alike will all undergo this treatment. The advantages of this method are many: A large number of possible base materials (plastic materials other than ABS are usable), the deposition of all types of metals and alloys, making possible the obtention of a wide range of surface finishes, and a very substantial economy of metal. Only the portions requiring treatment are coated, and thickness of coating is measured in tens of angstroms instead of microns. Furthermore, the process is not pollutant, thus eliminating the need for treatment of effluents. Since the facility will not have to be used to 100 percent capacity for the first few months (it represents a tripling of current capacity for this type of pieces), it will amply accommodate the testing necessary for the creation of new pieces. Initially, the metal deposited will be a nickel-chrome alloy, the hue of which will closely resemble that of classic chrome, so that the new pieces will blend well with classic ones. [Article by Christian Guyard] [Text] [Paris INDUSTRIES & TECHNIQUES in French 1 Mar 82 p 10] 9238

CSO: 3102/239

PROGRAM FOR LOANS TO INNOVATIVE BUSINESSES

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 82 p 12

[Article by Pierre Michel: "Innovation Loan Credits Opened"]

[Text] Supplementing the existing aids and incentives to innovation being distributed by ANVAR [National Agency for the Valorization of Research], innovative enterprises will be able to benefit from new provisions in three domains: MTI [Medium Term Innovation] loans; PPI [Participational Innovation Loans]; long-term credits. The minister of research and technology announced this important decision on 4 February to become effective on that date.

The MTI is a type of financing in which, on the one hand, a banking establishment advances the funds and, on the other, the CEPME [PME [Small- and Medium-Size Businesses] Equipment Fund] and its subsidiary INODEV [expansion unknown] stand surety for the borrower, so that the banker assumes no risk. For this purpose, INODEV is provided with a Guaranty Fund by the public authorities (65.6 million francs by the state and 12.5 million francs by Regional Public Establishments).

A More Reasonable Price of Money

Since the start of the system--September 1978--the number of loans processed has totaled 386, three-quarters of which by a regional delegation of the CEPME's 20 such delegations. These loans have totaled 237 million francs, 35 percent of which amount has been handled through regionalized procedures. For 45 percent of the sums involved, the credits were opened in 1981.

But an increasingly acute problem has arisen over the past few months owing to the general rise in the price of money. The latter has made access to MTI credit more difficult , since adding the bank interest rate, INODEV and CEPME commissions, and subscription to the INODEV Guaranty Fund often brings the total price to over 20 percent.

The new system that went into effect on 4 February, based on an agreement between the Ministry of Research and that of Finance, represents a considerable forward step. Loans will now be granted at a preset and posted rate: 15.50 percent maximum, all commissions included; that is, innovative businesses will have

the benefit of the lowest available rate in effect on the money market, to which is added only the INODEV-CEPME commission (1.50 percent). The INODEV Guaranty Fund subscription (3 percent) is eliminated; it is replaced by a participation in the capital of INODEV (0.1 percent of the amount of the credit utilized).

Another important new feature is that no real or personal guarantee of any kind is required of the borrowing enterprise. The latter may thus turn to MTI loans for the full funding of an innovational program, obtaining 2- to 10-year loans. The CEPME-covered exposure under these credits, which has been 75 percent, will now be 100 percent.

These MTI credits can be supplemented if necessary either by sectoral incentives instituted by one or more of the technical ministries, or by regional incentives distributed by Regional Public Establishments. A certain number of regions have already begun looking into these new mechanisms: Alsace, Pays de Loire, Midi-Pyrenees, Haute-Normandie, Ile de France, Franche-Comte, Nord-Pas-de-Calais. Going beyond its role as guarantor, INODEV will extend its activities into a new domain, making its services available to businesses to carry out economic viability studies for them. It is in this domain that an innovative enterprise encounters its main problems.

PPI's are frequently linked very closely to MTI credits. The two types of applications are considered together and the procedures for granting them are generally coupled. In effect, when an enterprise undertakes a new innovative action it normally finds it necessary to restructure its finances and to consolidate its own funds. Hence the advantage of this coupling.

The Long Term As Well

The PPI may be considered a loan in the same class with owned funds. Its interest rate is variable in accordance with the results of the enterprise, but may not exceed in any case the loan discount rate plus 2 percent, which currently would be 17.50 percent. Under the new provisions announced by J P Chevenement, the covered exposure under these credits will be 75 percent and the banker will thus be relieved of three-fourths of the risk by INODEV and the PPI guaranty fund. These organizations can also decide, where warranted by minimum-risk files, to take under coverage an even larger portion (85 percent) of the risk, reducing the banker's risk to 15 percent. Thus, a very important new role has devolved upon INODEV, whose capital is to be opened to the entire financial community and whose cooperation with ANVAR is to be strengthened.

Over and above the MTI and PPI sectors, the authorities have also taken steps to improve the long-term credit situation. The government has decided to reserve 1 billion francs for loans at deep-discount rates. These credits will be distributed by specialized establishments under the technical control of the Ministry of Research and Technology. They can be combined with MTI credits and covered by the INODEV Guaranty Fund.

How To Work with INODEV

INODEV, a corporation created in 1978, has as its object the financing of all the needs of enterprises set up to launch inventions industrially and commercially. These financings are provided through banking channels, with INODEV providing the guarantees for the borrowers. This institution has at its disposal, through the CEPME, 20 regional delegations and 7 branch offices. For credits equal to or less than 1 million francs, the procedure is fully regionalized. An MTI credit for a period of 2 to 10 years, frequently coupled with a PPI, covers 70 percent of the expenses, all taxes included, of a program of present innovation. A deferment of capital amortization during initial years is possible. PME's can obtain aid through INODEV in the form of both the financial structuring of its venture and, together with it, an economic and marketing viability study of the innovation involved.

The borrower has a period of 1 year in which to use the credit in one or more instalments.

[Address]: INODEV, 14, rue de Gramont, 75002 Paris. Tel: 261.85.75.

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CSO: 3102/238

SCIENCE POLICY

POST-NATIONALIZATION DEVELOPMENT STRATEGIES OUTLINED

Paris INDUSTRIES & TECHNIQUES in French 10 Mar 82 p 15

[Article by Pierre Michel: "After Nationalizations, Industrial Interlacements"]

[Text] After 7 months of heated debates and two reviews by the Constitutional Council, the nationalization law has now been put into effect. Its implementation translates into the transfer of five of the biggest French industrial groups, 39 banks and two financial enterprises--Paribas and Suez--to the public sector.

The French state finds itself today at the head of a public sector without equal in the Western world, controlling as it now does 80 percent of the credits and deposits of the banking system as a whole, 32 percent of the annual, before-taxes revenues of industry, 23 percent of industry's employees, one-fourth of France's exports and half the industrial sector's research.

Poles of Orientation

The public powers--which have never heretofore so borne out this designation--will now control directly or indirectly (through 50-percent or greater ownership) around 3,500 enterprises, 2,500 of which are headquartered in France.

The nine industrial groups that will now be controlled by the state (USINOR [expansion unknown], SACILOR [Lorraine Steelworks Co], Thomson-Brandt, PUK [Pechiney-Ugine-Kuhlmann Company], CGE [General Electrical Company], Rhone-Poulenc, Saint-Gobain, Dassault, MATRA [Mechanics, Aviation and Traction Company]) represent, according to the Industry Ministry's own figures, a consolidated annual turnover of 150 billion francs (1980 balance sheet) and a total of 750,000 permanent employees.

What industrial strategy will they be required to follow? Initially, it would appear, the government intends to work at "interlacements": It will organize, within various key sectors, vertical and horizontal groupings, integrating everything connected with their activities and of international dimension such as will enable them to face up to (or dialogue with) the biggest and become poles of orientation and development for smaller-sized enterprises.

Five of these interlacements were discussed by Pierre Dreyfus at a recent meeting of ministers:

--Steel: Following the nationalization of SACILOR abd USINOR, a "steel plan" will be set up before the end of the first half of this year. Its objective: To restore to these two groups, within 5 years, a competitivity on the European scale. The nationalization and diversification of downstream activities (metallurgical products) will be defined at the same time. Yet to be worked out in detail, in particular, is the possible expansion of the steelmaking groups into the heavy mechanical, naval construction and tube manufacturing industries. And the fine tuning of a "special steels" program, eliminating redundancies in the industries now connected with USINOR and SACILOR.

--Chemicals: "A victim of the energy crisis and of too wide a dispersion of industrial structures," says the (very vague) communique of the Council of Ministers, "the regroupment and specialization of the activities of this industry around these two or three more powerful groups will facilitate the control of raw materials supplies and of markets." Here again, in fact, it will be necessary to bring order within a branch of industry that has fallen behind these last few years and that involves 300,000 employees. Within its various sectors, therefore, it will be necessary to coordinate strategies relating to the procurement of raw materials, production, and marketing, through a working agreement among Rhone-Poulenc, PCUK [expansion unknown], CDF [French Coal Board] Chimie, Elf Aquitaine...

--Electronics: This interlacement is to be organized--from components to hardware to software--around national groups formed (or to be formed) by Thomson, CGE, CII-HB [expansion unknown], and MATRA, and linked to the Ministry of PTT, the CNET [National Center for Telecommunications Studies]. The objective is to put together a grouping that will be capable of negotiating agreements, on an equal footing, with big foreign firms.

A weak point in this interlacement: components. Unknown factors as of now are the position of Honeywell (47 percent capital ownership in CII-HB) and that of Olivetti, in which Saint-Gobain owns 35 percent of the capital shares.

--Materials: The purpose here is, through PUK, Saint-Gobain and certain branches of CGE, to press forward with research on new materials (fibers, composites, ceramics, super alloys), with the aid of the Ministry of Research and Technology, to make them available especially to the building trade.

--Health industries: There is a need to conjugate the efforts and resources of Rhone-Poulenc and of SANOFI [Financial Combine for Sanitation and Health], a subsidiary of Elf Aquitaine in the domain of bio-industrial and genetic engineering pharmaceuticals. Roussel-UCLAF [expansion unknown] could later join this group if an agreement can be struck with the German group Hoechst.

The state is going to have to inject considerable sums into the different interlacements. The minister of industry, in a recent interview, put at 10 billion francs in 1982, and as much again in 1983, the funds that will be necessary to

Share Held by Public Enterprises of Gross Turnover in Branch

Sector	Percent Before	Percent After
Steelmaking	1	80
Initial transformation of steel	1	58
Metallurgy and initial transformation of nonferrous metals	13	63
Base chemicals	23	54
Artificial textiles	0	75
Transformation of plastic materials	4	15
Fine Chemicals	5	14
Pharmaceuticals	9	28
Glass	0	35
Construction materials and ceramics	1	8
Cardboard	0	9
Foundry	4	22
Metalworking	2	8
Machine tools	6	12
Industrial equipment	3	14
Heavy equipment (materials handling, mining, steelmaking, civil engineering)	0	5
Armaments	58	75
Office automation and data processing	0	36
Electrical equipment	0	26
Household and professional electronic equipment	1	44
Household equipment	0	25
Naval construction	0	17
Aeronautical construction	50	84
All industrial branches	18	32

A public sector without equal in the Western world.

bring order to the financial situation of the five new national enterprises. To this must be added the specific internal needs of the steel industry and those of other public enterprises. And those of other interlacements that are bound to emerge over the next few years.

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TRANSPORTATION

MBB EXECUTIVES DISCUSS COMPANY'S PLACE IN CIVIL AVIATION

Duesseldorf VDI NACHRICHTEN in German 26 Mar 82 p 26

[Interview with Professor Engineer Gero Madelung, chairman MBB business management, and Dr-Eng Othmar Heise, director, Central Sector for Development: "MBB Puts Its Money on the Creative Engineer-Germany a World Leader in Aviation and Space Technology"]

> [Text] MBB (Messerschmitt-Boelkow-Blohm) is a big aircraft and defense equipment enterprise in Germany and it leads in space technology in Europe. Just exactly where it stands internationally with its know-how,what civilian engineering spinoff derives from its defense equipment development work, what role the MBB engineers play in this process, and what effects the Bonn economy measures are having on the enterprise--these are question complexes which Professor Engineer Gero Madelung, chairman, MBB business management, and Dr-Engr Othmar Heise, director, Central Sector for Development, discussed in a VDI Nachrichten interview in Munich.

VDI NACHRICHTEN: There is talk about war, about military equipment, which is supposed to be the mother of all technology. Is this just a saying or is MBB convinced that this is so?

Madelung: We need not necessarily have to trouble history to document the real nucleus of this idea. The Boeing 707, for example, sprang from the American military transport aircraft program. And the American space program, which likewise has a military origin, gave TV satellites to all the world. Yes, the saying even applies to technical developments in present-day Japan.

VDI NACHRICHTEN: How do you explain that?

Madelung: In defense technology, the important thing is to find a technical response to the anticipated technical efforts of a potential military opponent. That can be even more existential than the toughest competition fight in economic life--and this most quickly leads to top-level achievements in the light of past experience.

VDI NACHRICHTEN: MBB achieved its top results likewise in defense technology development. What was the share of government orders here?

Heise: Military equipment accounts for DM3 billion, in other words, 60 percent of our sales volume in 1981, about DM4.7 billion. Defense ministry orders thus play an important role in the enterprise, particularly also in the research and development sector. In 1981, our contract research volume was DM350 million. To that you have to add DM250 million in conditionally repayable subsidies. On top of that, MBB during that same year also spent DM120 million for "free," in other words, in-house-financed research and development. The BMFT [Federal Ministry of Research and Technology] share out of the business volume comes to about 3 percent, that is, 3 percent in the "very high-technology" items. The sum from in-house-financed and loan-based research funds totals about 8 percent. In percentage terms, we can be compared here to enterprises such as Boeing or Siemens.

Free Development Being Boosted

VDI NACHRICHTEN: What does it mean for MBB development activities when Bonn is now also starting to cut defense expenditures?

Madelung: Less contract-based development. But to keep up, we must behave in an anticyclic manner and we must boost free development. This year, we are going to spend DM175 million for free research and development. We must get through this dry spell, we must not tear development teams apart, and we must keep our product line conpetitive.

VDI NACHRICHTEN: What would be the consequences of a longer-lasting Bonn savings drive concerning arms orders?

Heise: The important thing is to prevent a renewed decline in the German aviation and space industry to the level of a licensee or subcontractor. Progress in European integration in this sector of industry and administration would be in doubt. The natural knowhow transfer from military to civilian projects would be reduced, with the result that the civilian sector would likewise find its technological capacity weakened.

VDI NACHRICHTEN: This knowhow is being developed by about 6,000 engineers working for MBB. Dr Heise, our readers are certainly interested in what specialized fields are represented here.

Heise: The machine-builders are represented most frequently and aircraft builders and engineers working on measurement and control instruments dominate among them. Next we have the electrical engineers, above all from microelectronics and information science. Including natural scientists, we have something like 4,000 engineers on the B.S. level, the others have master's degrees and PhD's. Some of those 6,000 are, so to speak, the "critical mass," in other words, the necessary minimum to be able to engage in meaningful development to begin with. For the development of a combat aircraft, this "critical mass" is about 600 engineers.

VDI NACHRICHTEN: Is MBB also pursuing pure basic research?

Heise: Probably less than 1 percent of the total R&D force. As an example we might mention aerodynamics here; we are working here among other things on the fundamental but technically extremely interesting problem of the separation of air flow along the wings.

VDI NACHRICHTEN: In what specialized fields do you have your strong points?

Heise: Certainly in fiber technology. MBB here did trail-blazing work with the glass-fiber sandwich material for helicopter rotors and the broad use of this technology in aircraft construction today can be compared only to the transition from canvas skin to light-metal skin. Quite obviously, we are very much concerned here with aerodynamics, quality testing, and nondestructive materials testing plus the glueing of metals, operations research methods, the development of acoustic and optical sensors, as well as system engineering and measurement and control engineering which run through all of our activities like a connecting thread.

Switching From Team to Team

VDI NACHRICHTEN: What is the management principle which MBB uses in this "think tank?"

Heise: We are working by teams which give the individual staff member the feeling of more freedom than in a strict hierarchy. This is indispensable for creative processes. Changing from team to team is possible and also desirable. The average size of the team is between 10 and 40 people. Teamwork motivates enterprise-oriented thinking. Early this year, Professor Madelung urged the staff members to emphasize this aspect even more.

Madelung: By the term "enterprise-oriented engineer" we mean the creative engineer, we are talking about the man who achieves creative results with a certain degree of discipline. Discipline here means that the desire to create must remain within the limits of that which is economically feasible. Beyond that, discipline and cost-oriented thinking are not only requirements but also "stimuli" for creative brains.

VDI NACHRICHTEN: And is MBB successful in this?

Heise: Through this philosophy, MBB managed to catch up internationally already during the 1960s in spite of the forced break in our development work after the war. The result is quire respectable. Today we are working on about 20 major international projects and around 200 minor ones. An even larger number of study titles is in a preliminary phase and is, so to speak, ready for transition to a project-oriented development effort. Besides, our record of patents is definitely positive.

VDI NACHRICHTEN: We are quite familiar with the MBB defense showpieces, such as Tornado, AT rockets, or attack helicopters. What about the civilian engineering utilization of this defense creativity?

Madelung: As a result of the merger with VFW [United Aeronautical Works], we were able to expand our civilian engineering activities. We used military technology in the Airbus. This is the most recent example showing the first-time use of the digital autopilot, based on a feature of the Tornado, as used in a civilian aircraft. Our helicopters went into series production first for the civilian versions and military components development were included in that program. We are now also using fiber technology employed in helicopter rotors for the single-blade rotor of the Monopteros wind energy converter. The light-structure knowhow derived from aircraft engineering again is expressed in MBB freight car construction and the knowhow in measurement and control equipment engineering for example is expressed in the motor for heliostats used in solar power plants.

VDI NACHRICHTEN: Just exactly how large is the civilian share of MBB output?

Madelung: At this time it is around 40 percent but there is a rising trend here. An expansion is conceivable above all in the areas of rotary wings and big aircraft as well as energy and transportation equipment.

VDI NACHRICHTEN: Where does MBB stand as aircraft builder in technical terms in the context of an international comparison?

Madelung: We cannot offer the broad spectrum of the United States competition but in engineering terms we are quite far forward with transport aircraft, rotary-wing aircraft, combat aircraft, smaller missiles, and in satellite technology. Our Augsburg plant, where we make the Tornado, is the world's most modern aircraft factory with its automatic production line. It turned out on the world market for aircraft that the manufacturer is expected to offer aircraft families. This is something we have to keep in mind in the Airbus if we want to continue to remain competitive.

VDI NACHRICHTEN: What about technology transfer at MBB in general?

Madelung: The control equipment used in Augsburg naturally also benefited the suppliers of these machine tools. Something similar applies, for example, to our titanium technology. As everywhere else, the subcontractors benefit from our knowhow also in our case. Looking at a combat aircraft, 65 percent of the volume at any rate are awarded to the outside.

VDI NACHRICHTEN: Is MBB advocating government research subsidies?

Madelung: In key areas, absolutely. The areas which are being promoted in Japan and the United States must also be promoted in West Germany. The big American manufacturers, for example, share in strategic armament funds--which are not being used in West Germany--when it comes to aircraft development.

VDI NACHRICHTEN: What about cooperation with large-scale government research installations, such as, for example, the DFVLR [German Research and Development Institute for Air and Space Travel]?

Madelung: We are cooperating, for example, in those fields where we have a common client and that as a rule is the government. The DFVLR moreover has facilities, such as wind tunnels, for example, which we can also use. We are not as strong in terms of capital as our competitors who can afford having their own big wind tunnels.

International Cooperation

VDI NACHRICHTEN: What about international cooperation?

Madelung: That already springs from the fact that all of our big projects are after all international. Moreover, there is for example also an exchange of knowhow within the NATO context.

VDI NACHRICHTEN: With 2,200 staff members active in this field, MBB is one of the biggest enterprises in Europe in space technology. Do you believe that the civilian sector of space technology has a future?

Madelung: Getting into the commercial satellite business is worthwhile but it is also difficult essentially since the pertinent industry in the United States has big military contracts and produces satellites in series. So far we are only making individual copies.

Heise: The only exception is "Intelsat V" for which we presently have orders for 11 structural components, with options on five. At any rate, since we are a non-American company, we did get a contract for a payload for the Space Shuttle, that is, the Spas [space] Platform.

VDI NACHRICHTEN: How important is "Ariane" for the European space industry?

Madelung: Without our own European launch possibility for big commercial satellites, we would have no chance for our satellite production. This is why the rocket is being boosted successively for higher payloads.

VDI NACHRICHTEN: Your statements again and again contain the observation that, in other countries, the government order base via military expenditures for enterprises of the size of MBB is broader than in the FRG. Is this supposed to be a gentle reproach?

Madelung: The space sector in the FRG is purely civilian. Because our neighbors France and Great Britain have a military component here likewise, we believe that we are facing competitive disadvantages which we seek to balance out through our own free research funds.

VDI NACHRICHTEN: Are the Europeans planning reusable space vehicles?

Madelung: The competitive capability of the Europeans as against the United States must be increased. This means that we must be able to offer reusable systems. Our space platform is a beginning here. Perhaps other concepts--assuming money is available--will someday become reality, as you reported in your issue of October 1981.

VDI NACHRICHTEN: How can MBB assert itself in the future in a continuing public economizing climate?

Madelung: We did of course become known as a think tank but we are primarily an economic enterprise and we therefore must behave on the market like any other industrial firm. We cannot live on dreams for the future. That also means that we must rationalize. For example, we are investing to make our production of Airbus parts even more efficient. Our immediate goal is to turn out eight aircraft per month. If the business volume should stagnate, MBB furthermore will probably not be able to avoid reducing the total workforce of 40,000 by about 4,000 jobs over the next 4 years; here of course we want to make use of natural attrition to the extent possible. The age structure will be a problem. Today I can only point out that the integration of VFW into the enterprise is taking place more smoothly than we had anticipated. The organizational merger with VFW into product-oriented enterprise divisions has been completed.

VDI NACHRICHTEN: A concentration of resources can be observed internationally in your branch and in others. Is MBB--which after all combines all German aircraft engineering firms with just one exception--planning further mergers?

Madelung: We must expand in order to be able to keep up in this technically and economically hard-fought market. Larger aircraft and space technology units would be desirable in Europe but the national viewpoint is opposed by sovereignty viewpoints which, as we learned from the VFW-Focker experiment, play an enormous role. Times do not yet seem to be ripe for such mergers. In case of future necessary mergers of MBB, the boundaries of the FRG will probably not yet be crossed.

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FIBER OPTICS USED TO CHECK FOR AIRCRAFT STRUCTURAL CRACKS

Stuttgart FLUG REVUE in German Apr 82 p 62

[Text] In order to detect cracks in metals and laminated fiber structures, technicians used very fine wires or conductive paints which were applied to samples or long-term test pieces. If the material cracked, the circuit was interrupted. The method has errors and is subject to disruptive influences. A new system using light conducting fibers as a crack sensor, which perform the same task much more precisely, has been developed at VFW [Consolidated Aircraft Works].

Light conducting fibers that can be used for this purpose are between 30 and 100 micrometers thick. They consist of a glass core and sheath of different optical density. Through the overall reflection, characteristics of optical transmission are created which can transport light over considerable distances (about 10 to 20 meters for this application). The individual fibers are bonded so firmly to the aluminum with a two-component zinc-chromate primer that the tiniest hairline cracks in the metal structure are transmitted directly to the light conducting fibers. At the smallest break in a fiber, the "light flow" is interrupted. Test pieces are exposed to a beam of light. As long there is no crack present, the light is transported undisturbed. A 1-watt light bulb, or alternatively a photodiode with a circuit booster behind it, serves as transmitter and receiver. Through a more complex method of light input from LEDs, semiconductor lasers or flash lights, the detection possibilities can be improved.

For broader application, the team in Bremen has developed a procedure which allows rapid application of the light conducting fibers by means of a special film. Using this procedure, it will be possible to examine even extremely complicated structures in crack-prone areas.

The researchers in Bremen believe that, in addition to the many areas of application in vehicle and container construction, in subways, cranes, bridges and nuclear reactors, it is principally air and space travel that will derive considerable benefit from this development. Expensive total inspections, which frequently require total dipping of cell structures before X-ray and ultrasonic inspections are conducted, are rendered superfluous. The crack sensor can be activated at any time as a silent spy. The first application: Structural components in the fuselage of the A 310 Airbus.

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FRG PLANS TO PLACE MORE EMPHASIS ON WHEEL-ON-RAIL R&D

Duesseldorf VDI NACHRICHTEN in German 26 Mar 82 p 2

[Article by Ralf Roman Rossberg: "Wheel-Rail Research To Be Further Promoted--Balance With Magnetic Transportation Engineering--Emphasis Initially on Tests and Experiments"]

> [Text] The BMFT (Federal Ministry of Research and Technology) is presently promoting mostly the magnetic suspension technology in the field of track-bound long-distance express travel which is definitely borne out by the Transrapid experimental facility in Emsland. The ministry nevertheless does have the intention as soon as possible again to pay more attention to wheel-on-rail research. The objective is still to return to an evenly balanced promotion of both of these most important railroad engineering development lines, that is, wheel-on-railand magnetic movement technology and thus to establish equal opportunity between both lines for a necessary system comparison.

Research promotion presently is concentrated in the wheel-on-rail sector on the development and construction of an experimental and demonstration train which is to consist of two motor coaches with, initially, two cars in the middle and which could be considered as a forerunner of a new generation of fast rail vehicles. The trouble spot here however is the financing question. The BMFT views "essential participation by industry and the German Federal Railroad to be indispensable not only for financial reasons." The Federal Railroad however feels that research promotion could not do justice to its immediate enterprise objectives, particularly in view of the extremely critical financial situation. The BMFT however wants to supply only 50 percent from its funds; the other half is supposed to be contributed by industry and the Federal Railroad.

By order of the Transportation Committee of the German Federal Railroad, it has in the meantime been investigated whether and where there are suitable testing possibilities or whether or where such possibilities could be created on short notice in the line network of the Federal Railroad for this kind of experimental and demonstration train. Accordingly, trial runs can be made at up to 250 km/hr

--with some restrictions--on the existing Rheda--Oelde line segment in Westphalia and at even lower speeds possibly also on other segments. But it is especially the upper speed range of up to 300 km/hr which is considered to be decisive for future developments here. This is why the Federal Railroad and industry are urgently waiting for a suitable experimental facility outside the railroad operating network. The Rheine--Freren section of the old Oberhausen --Rheine--Wilhelmshaven line has been earmarked for this purpose; it is needed for freight transportation only to a minor extent; because of its more than approximately 23 km of completely straight line layout, it seems well suited as test line and some segments have already been prepared for this purpose.

The DM108 million already approved for the development of the experimental facility however were again deleted by the BMFT in view of the budget situation in the autumn of 1980. This promotion effort now is supposed to complete for the time being at least the plan determination procedure in order to keep an option open for the selection of this line segment in medium-range terms. It is expected that the wheel-on-rail experimental track can be improved as soon as the first construction phase of the Emsland magnetic suspension experimental facility has been completed, presumably in 1983.

In the meantime, wheel-on-rail experiments are being concentrated at the test stand. The rolling test stand, erected in Munich-Freimann, is being promoted with BMFT funds. It is to be used increasingly for experiments with up to four axles and simulated speeds of up to 500 km/hr. A complete rail vehicle will be placed on the test stand for the first time now, after investigations so far had been confined to individual axles and trucks. Theory and practice produce good agreement during the start-up phase of this comprehensive experimental facility in the light of what we can judge so far. The BMFT therefore believes that there are suitable possibilities here for continuing this effort until the "equal opportunity" which has been promised can be achieved and until the Rheine-Freren wheel-on-rail experimental facility can be completed.

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